Session: NS1-ThM3 **Integration of Ion Beams with Scanning Probes for Local Doping and Chemical Analysis of Materials**

Abstract # 1027

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Abstract:

We describe our newly developed scanning probe instrument which integrates ion beams with imaging and alignment functions of a piezo resistive scanning probe in high vacuum. In the past, Scanning Probe functions have been combined successfully with lasers, excited reactants, as well as neutral beams for surface analysis or materials modification at a nanometer length scale. In our approach, we transport beams of energetic ions (1 to 200 keV) through small (5-30 nm diameters), high aspect ratio holes (>5:1) in the scanning probe tips. Holes are formed by Focused Ion Beam drilling and thin film deposition. Transport of single ions can be monitored through detection of secondary electrons that are emitted when ions impinge on sample surfaces. Secondary electron yield enhancements for highly charged dopant ions (e. g., P15+, or Te36+) allow efficient detection of single ion impacts for single atom device formation. Detection of secondary electrons and ions enables adaptation of a time-of-flight secondary ion mass spectrometry scheme for correlation of scanning probe images with chemical and molecular composition information on a 10 nm length scale. In our presentation we will discuss potential and limits of this approach in ion placement resolution, sensitivity in surface analysis, as well as issues of probe lifetime and effects of ion guiding in dielectric nanoholes.

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